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Atlantic Echiurans
Part I. Report on twenty-two species of deep sea echiurans of the North and the South Atlantic Ocean

by A. K. DattaGupta *

Résumé. — La description de vingt-deux espèces abyssales d'Échiuriens, dont huit sont nouvelles, a été réalisée à partir du matériel provenant de l'Atlantique Nord et Sud. Les spécimens ont été récoltés au cours des missions de biologie abyssale organisées par le Centre océanologique de Bretagne entre 1969 et 1976, et triées par le Centre National de Tri d'Océanographie Biologique (CENTOB) à Brest (France). Ces espèces appartiennent à quinze genres dont l'un est nouveau pour la Science. A l'exception de deux espèces du genre *Thalassema* (Fam. Thalassematidae), tous les Échiuriens étudiés sont des Bonellides (Fam. Bonnellidae), parmi lesquelles sept espèces ont été antérieurement décrites comme des formes de grandes profondeurs dans l'Ouest-Pacifique. Vingt-huit espèces étaient jusqu'ici connues dans le domaine littoral dans l'Atlantique Ouest : quatre sont étudiées ici.

Abstract. — Descriptions of twenty-two species, including eight new species, of deep sea echiurans (Echiura) have been given in this part of the report on the North and the South Atlantic Echiurans collected between 1969 and 1976 by the Centre océanologique de Bretagne and sorted by the CENTOB in France. These species belong to fifteen genera of which one is a new genus. Except two species of the genus *Thalassema* (Fam. Thalassematidae), all echiurans of this report are bonellids (Fam. Bonellidae) and seven species of these bonellids were earlier described as deep sea forms of the Pacific. Twenty-eight species have been known heretofore to occur in the coastal waters of the Atlantic, four of which are there in the present report.

Introduction

The author received 93 lots of echiuran animals (Echiura) through the courtesy of Mr Michel Segonzac, Chief of the Centre de tri d'Océanographic Biologique (CENTOB), France, for the purpose of identification. These animals are a part of the collections made by the Centre Océanologique de Bretagne during the abyssal cruises in the Atlantic Ocean, organised by the Scientific Department, between 1969 and 1976 and by the Station biologique de Roscoff, in 1973 (Thalassa 73). All these echiurans are deep sea forms and the preliminary sorting of the animals was done in the laboratory of the CENTOB. The prefix in a lot number indicates the zone of the Atlantic namely, the prefix Walda indicates the S-E Atlantic near the Walvis ridge, Noratlante the N Atlantic, Thalassa 73 the Bay of Biscay, and Biogas the abyssal region of the Bay of Biscay (map 1). Besides, the Ineal specimens were obtained from the zone of the Atlantic on the west of the British Isles

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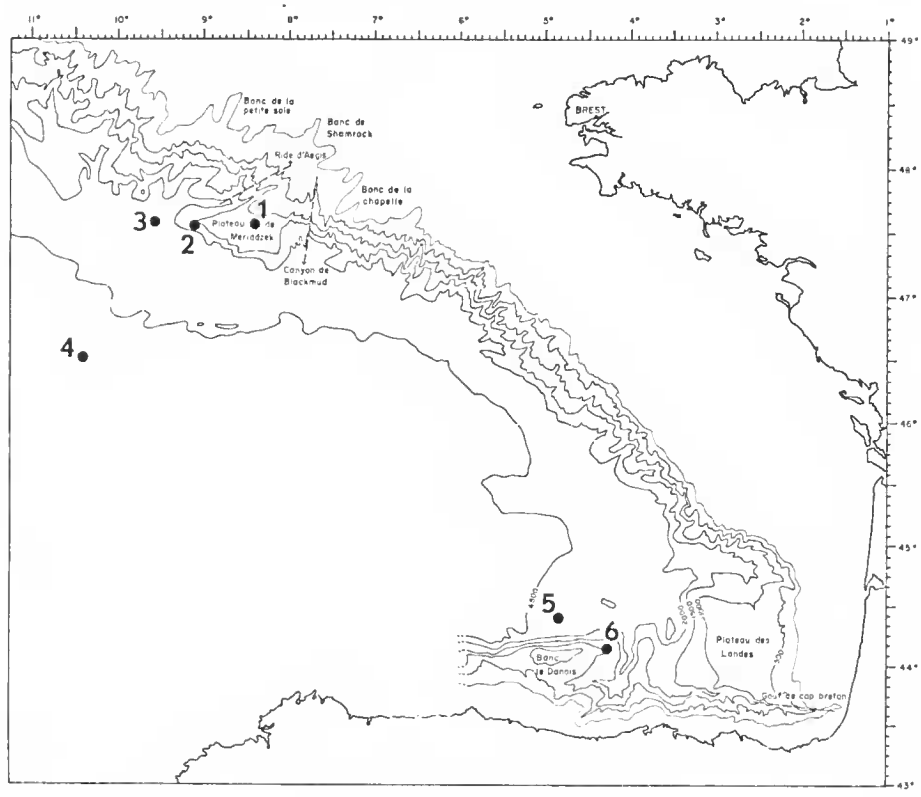
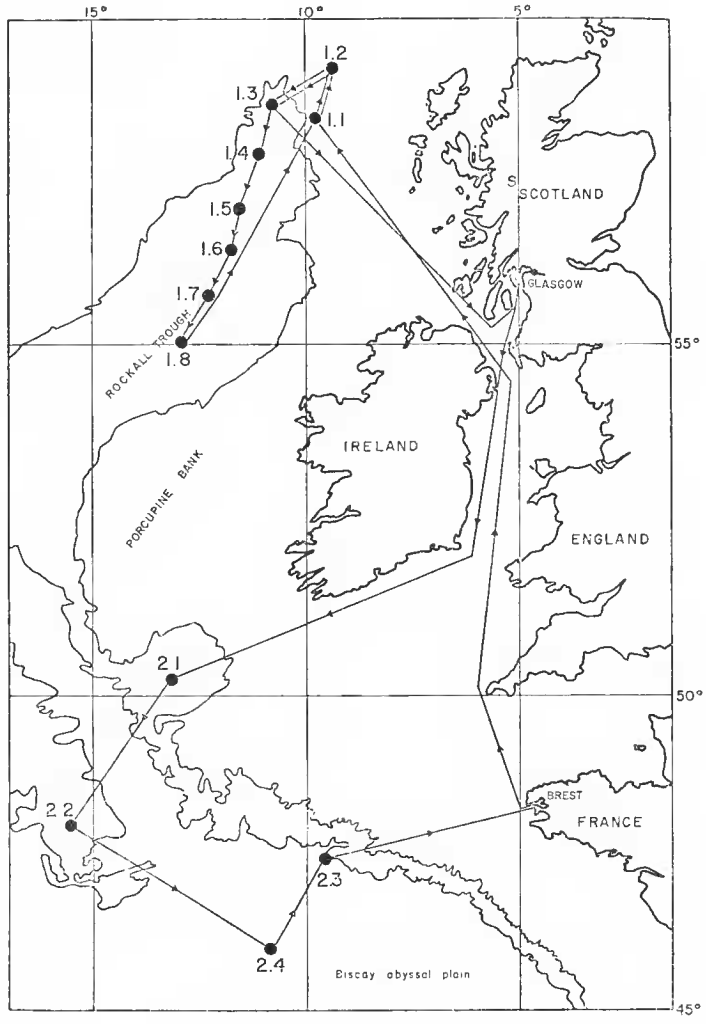
and Ireland between the coordinates 46°00-57°59′ N and 9°32′-15°23′ W (map 2). The author has at his disposal generally single representative members of the sorted lots of material and in a few lots more than one specimen for examination.



Map 1. — The Biogas stations.

There are several accounts of echiuran animals from the coastal waters of the Atlantic Ocean, and a total number of 28 species including 8 bonellidan species have been reported so far from these waters. The area from which these 28 species have been reported is extremely vast and extends from the coasts of Greenland and Iceland (Wesenburg-Lund, 1934, 1937*a* & *b*) through the Norwegian Atlantic coast (Danielssen and Koren, 1881*a*), the coasts of British Isles and Ireland (Southern, 1913*b* ; Stephen, 1941*b*, 1956), of France Cuénot, 1902, 1922), Spain (Hartman and Barnard, 1960), West Africa (Wesenburg-Lund, 1954*a*, 1957*c*, 1959*c* ; Stephen, 1960), South America (Amor, 1965, 1970), West Indies (Fischer, 1895, 1914, 1922*b* ; Augener, 1906 ; DattaGupta, 1977), North America (Pourtalés, 1851 ; Selenka, 1885), and the islands and deep waters of the Atlantic (Sluiter, 1900, 1912 ; Hérubel, 1924 ; Mackie, 1961 ; DattaGupta, 1975). These reports and the present collection indicate that the echiuran animals of the Atlantic Ocean are significantly numerous, and these represent many genera and species. In December, 1978,

the ship "J. Charcot" surveyed the Angola and the Cape basins during the Walvis cruise organised by the Centre Océanologique de Bretagne in the South Atlantic Ocean. This survey revealed absence of echiuran fauna in the two regions (Mr M. Segonzac, *personal communication*). The occurrence of a significant number of echiurans in other parts of the Atlantic is interesting from the point of view of distribution of these animals.



Map 2. — The Incal stations.

The author examined 37 lots of specimens and in this part of the report the results of the examination of 26 lots consisting of 40 specimens have been given. The results of the remaining 11 lots will be published later along with the others. The author's taxo-

nomic deductions have been largely based on the study of body wall, proboscis, ventral hooks, gonoducts and anal vesicles of the animals. This is because the digestive system and associated parts of the vascular system of most of the animals have not been preserved well. The gonoducts and the anal vesicles, however, have been found undamaged in most of the specimens. The structure, number, or the position of the gonoducts, also the location of the gonostome and the modification of the gonostomal lips contain the key to the identification of many genera and species. The anal vesicles present several interesting structural conditions and, within a species the anal vesicles are consistent in their structural details and anatomical disposition. The shape or size of the proboscis or of the trunk have often been found to vary considerably within a species. Compared with the shape and size, the structure of the proboscis or the body wall is a better indication in order to diagnose certain genera or species. Information with regard to the habits and habitats of echiuran animals is rather limited. Echiurans are generally detritus feeders and there is only one genus which has been found to feed upon vegetable matter like decaying coconut husk and wood (DattaGupta, 1977 ; Torben Wolff, 1979).

DattaGupta (1970) recognized 4 families namely, Echiuridae, Thalassematidae, Ikedaidae and Bonellidae under the order Echiuroinea and listed *Bonellia*, *Protobonellia*, *Nellobia*, *Achaetobonellia*, *Prometor*, *Maxmuelleria*, *Jakobia*, *Tatjanella*, *Vitjazema*, *Alomasoma*, *Sluiterina* and *Choanostomellia* under the subfamily Bonellinae. The author proposes here a change in the list of genera by rehabilitating the genus *Achaetobonellia* under the subfamily Acanthobonellinae owing to the modification of the proximal part of the gonoduct to form male sac and large size of the male in *Achaetobonellia*. The genus *Tatjanella* has been regarded as synonymous with *Prometor* (Zenkevitch, 1964*a*). Subfamily Bonellinae should further include the genera *Eubonellia*, *Bonelliopsis*, *Torbenwolffia* and *Kurchatovus*.

Echiurans of the present report belong to 15 genera including a new genus and 22 species, 8 of which are new to science. Except 2 species of the family Thalassematidae all echiurans of the present report belong to the family Bonellidae. Most of the deep sea echiurans of the North Pacific Ocean reported earlier (Fisher, 1946, 1948*b*, 1949 ; Zenkevitch, 1957, 1958, 1964*b* ; Murina, 1976) also belong to the family Bonellidae. Indeed, several deep sea species of Bonellidae reported here are common to both the North Atlantic and the North Pacific Oceans. Apparently bonellids occur in the sea at all depths, from the intertidal zone to the abyssal or ultra-abyssal regions. Zenkevitch (1966) considered the extreme sexual dimorphism and the parasitic way of life of the males in Bonellidae are adaptations in response to deep sea life.

List of the genera and species of the present report

Thalassematidae

Thalassematinae

Thalassema Lamarck : *T. ovatum* Sluiter, 1902, *T. elapsum* Sluiter, 1912.

Bonellidae

Bonellinae

Bonellia Rolando, 1822 : *B. pumicea* Sluiter, 1891, *B. plumosa* n. sp.
Eubonellia Fisher, 1946 : *E. noratlanticum* n. sp., *E. longistomum* n. sp.

Choanostomellia Zenkevitch : *C. bruuni* Zenkevitch, 1964, *C. filatovae* Zenkevitch, 1964.
Charcotus n. gen. : *C. charcotus* n. sp., *C. clavatum* n. sp.
Maxmuelleria Bock, 1942 : *M. verrucosum* (Studer), *M. faex* (Selenka, 1885)
Prometor Fisher, 1948 : *P. pocula* Hartman & Barnard, 1960.
Alomasoma Zenkevitch, 1958 : *A. nordpacificum* Zenkevitch, 1958, *A. rhynchollulus* n. sp.
Jakobia Zenkevitch, 1958 : *J. similaris* n. sp.
Benolliopsis Fisher, 1946 : *B. minutus* n. sp.
Sluiterina Monro, 1927 : *S. flabellorhynchus* Murina, 1976.
Torbenwolffia Zenkevitch, 1966 : *T. galatheae* Zenkevitch, 1966.
Protobonellia Ikeda, 1908 : *P. mitsukurii* Ikeda, 1904.

Acanthohaminginae

Amalosoma Fisher, 1948 : *A. eddystonense* Stephen, 1956.

Bruunellia Zenkevitch, 1966 : *B. bandae* Zenkevitch, 1966.

Thalassema ovatum Sluiter, 1902

(Plate 2 A ; plate 3 A)

Material : 1 female, Walda DS 18 ; collected 22.VII.1971 : locality coordinates 6°34,7′ S-8°18,2′ E, depth 4 079 m.

Description : The preserved specimen is sandy grey in colour. Owing to damaged condition the body is unsuitable for measurement. Proboscis is fleshy and pale yellow in colour, measuring 4 mm in length ; it is wider proximally, the lateral margins of the proximal half are somewhat indented and inflected ventrally and join near the mouth to form an oral funnel (plate 3-A). Two ventral hooks are brown in colour. Gonoducts are 2 rounded bodies (plate 2-A) located posterior to the ventral hooks ; gonostome is basal. The posterior end of the alimentary tube is undamaged but the anal vesicles do not seem to be present.

Remarks : Sluiter (1902) named and described *Thalassema ovatum* on the basis of his studies of numerous specimens collected from the Bay of Bima, Indonesia. This is the first report on the species since its discovery and first record of its occurrence in the North Atlantic. Earlier, 8 other species of *Thalassema* have been reported from the Atlantic waters but none from such depth except *Thalassema steinbecki* which was collected from a depth of 4 031 m (DattaGupta, 1975). In the original description the animal is around 13 mm in lenght of which the proboscis is 3 mm. The present specimen is also of about the same size. The intriguing point is the anal vesicles which Sluiter did not find in any of his specimens. In the present specimen also the anal vesicles could not be seen. The species in all probability lacks anal vesicles like *Thalassema antarcticum* from Falkland Islands described by Stephen (1941).

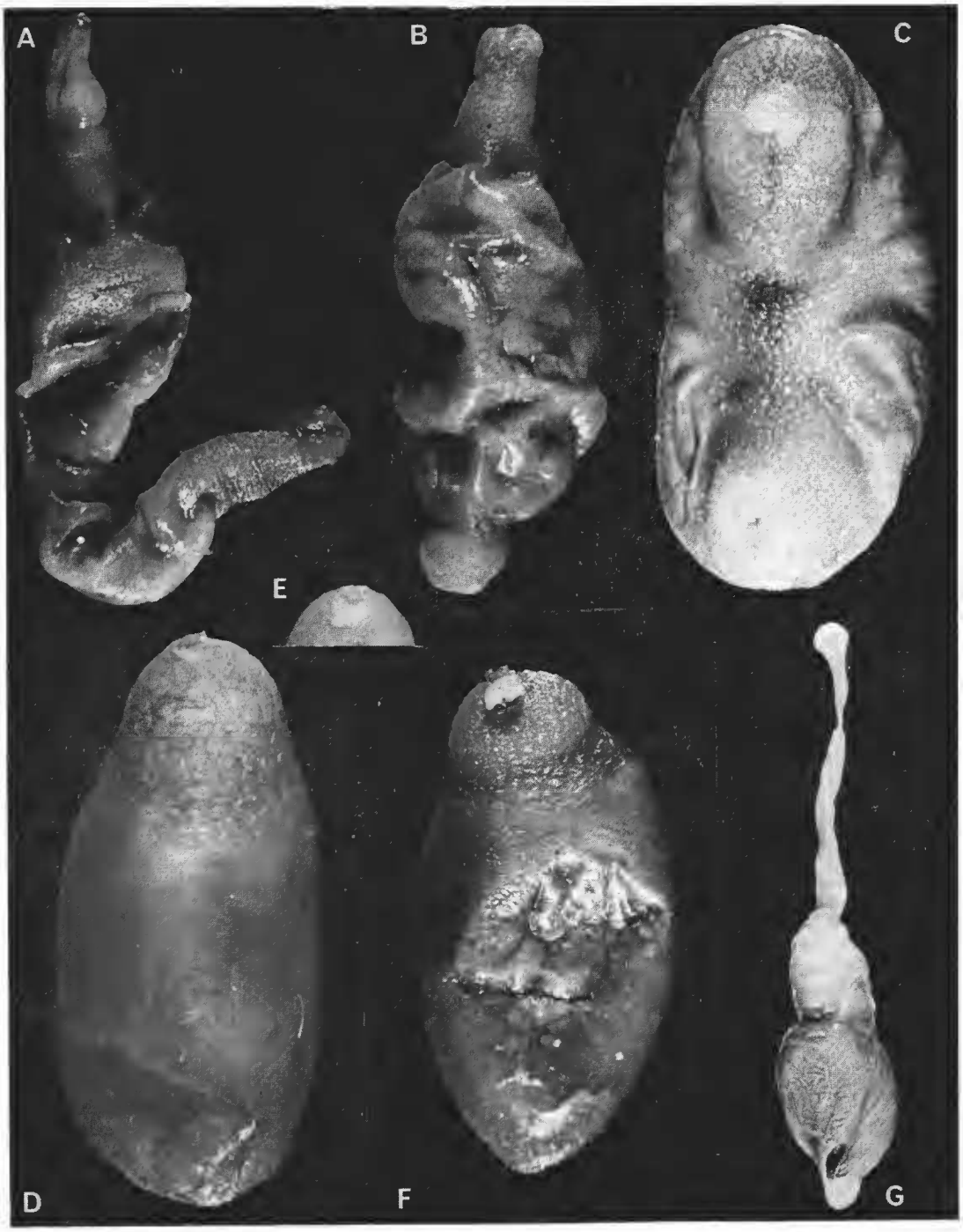


PLATE 1. — A, *Eubonellia noratlanticum* sp. n., B, *Eubonellia longistomum* n. sp., C, *Amalosoma eddystonense*, D, *Alomasoma rhynchollulus* n. sp., E, proboscis of *Alomasoma rhynchollulus*, F, *Alomasoma nordpacificum*, G, *Jakobia similaris* n. sp.

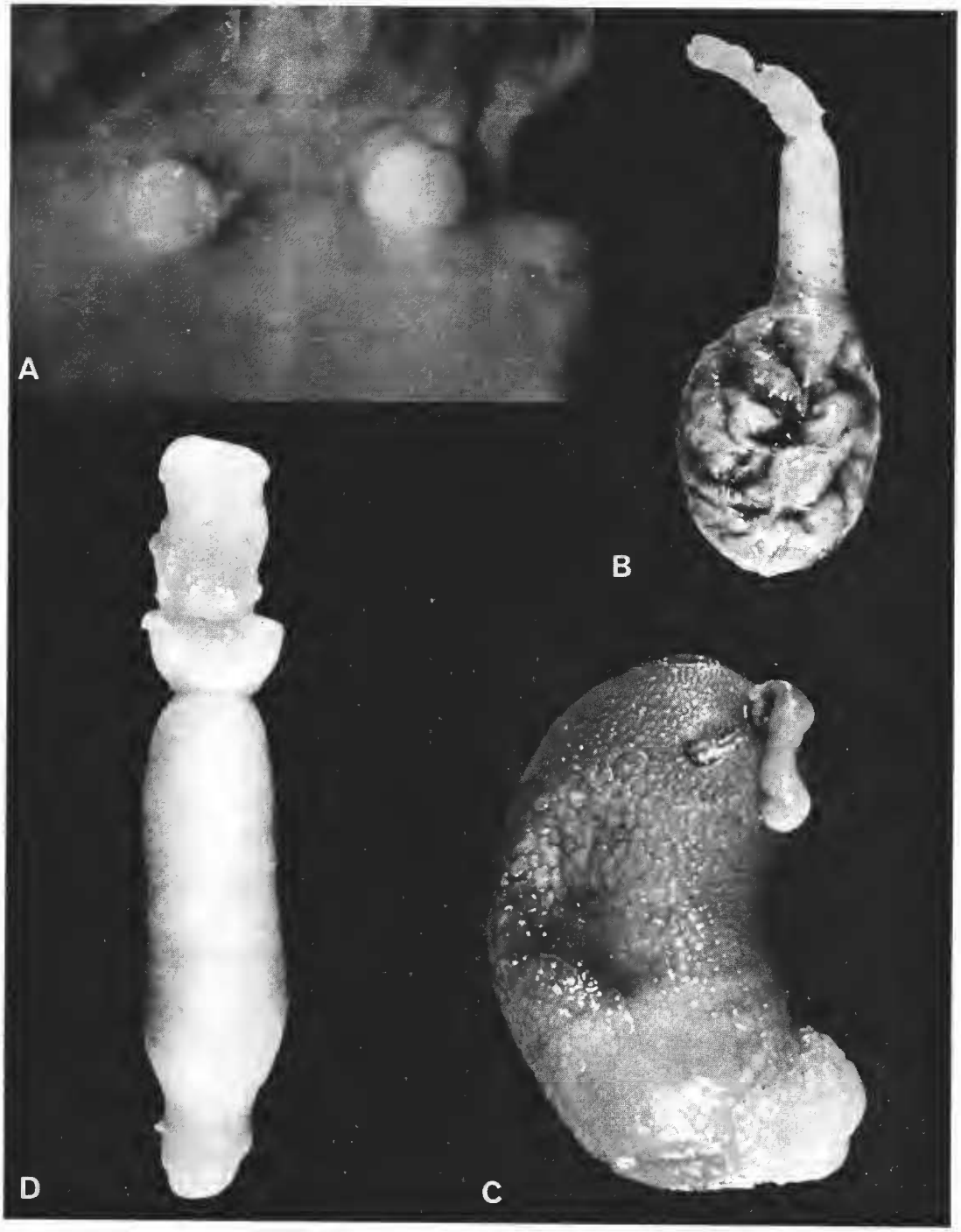


PLATE 2. — A, Gonoducts of *Thalassema ovetum*, B, *Charcotus clavatum* n. sp., C, *Prometor pocula*, D, *Choanostomellia filatovae*.

Thalassema elapsum Sluiter, 1912

(Plate 3 B, C)

Material : 1 female, Biogas VI DS 76 ; collected 23.X.1974 : locality coordinates 47°34,8′ N-9°33,3′ W, depth 4 228 m.

Description : The specimen is 14 mm long and 4 mm across the broadest part, with thick body wall but less conspicuous papillae. Proboscis present but perhaps missing, and a small broken stump dorsal to mouth is recognizable. There are 2 stout lemon yellow ventral hooks which are sabre shaped at the tip. Internally an interbasal musele is absent. Gonoducts : 2 pear shaped bodies located posterior to the hooks, gonostome basal, gonostomal lips : 2 large flaps characteristically folded. Anal vesicles are 2 tubular sacs bearing sessile funnels.

Remarks : The original description of the species (Sluiter, 1912) is on the basis of 10 specimens and the proboscis was missing in all these specimens. The proboscis of the species is probably deciduous. The gonostomal lips are folded in a characteristic manner. Sluiter also has described the gonostomal lips (nephrostomes) as " merely folded or crumpled ". *Thalassema elapsum* of the present collection is the second report of its occurrence in the Atlantic although from a much greater depth.

Bonellia pumicea Sluiter, 1891

(Plate 3 D)

Material : 1 female, Incal WS 09 ; collected 10.VIII.1976 : locality coordinates 47°28′ N-9°35′ W, depth 4 277 m.

Description : Body of the animal is rounded in outline and measures 0.75 mm in diameter antero-posteriorly. The proboscis is 1.25 mm in length and less than 0.25 mm in breadth ; anterior tip of the prohoscis slightly bilohed. Body wall of the preserved specimen is thin and somewhat transparent. Single gonoduct is oval in outline and is visible through the transparent body wall ; gonostome is located basally. Ventral hooks 2, the tips are brown in colour and the shafts are white. Minute anal vesicles appear simple sac like.

Remarks : The present specimen of *Bonellia pumicea* is much smaller in size than those described earlier. It is nevertheless assumable that the species *pumicea* is generally very small in size.

Bonellia plumosa n. sp.

(Plate 3 E, F)

Material : Holotype female. Thalassa Z 398 ; collected 22.X.1973 : type locality coordinates 47°36′ N-7°16,8′ W, depth 330 m. Holotype dissected.

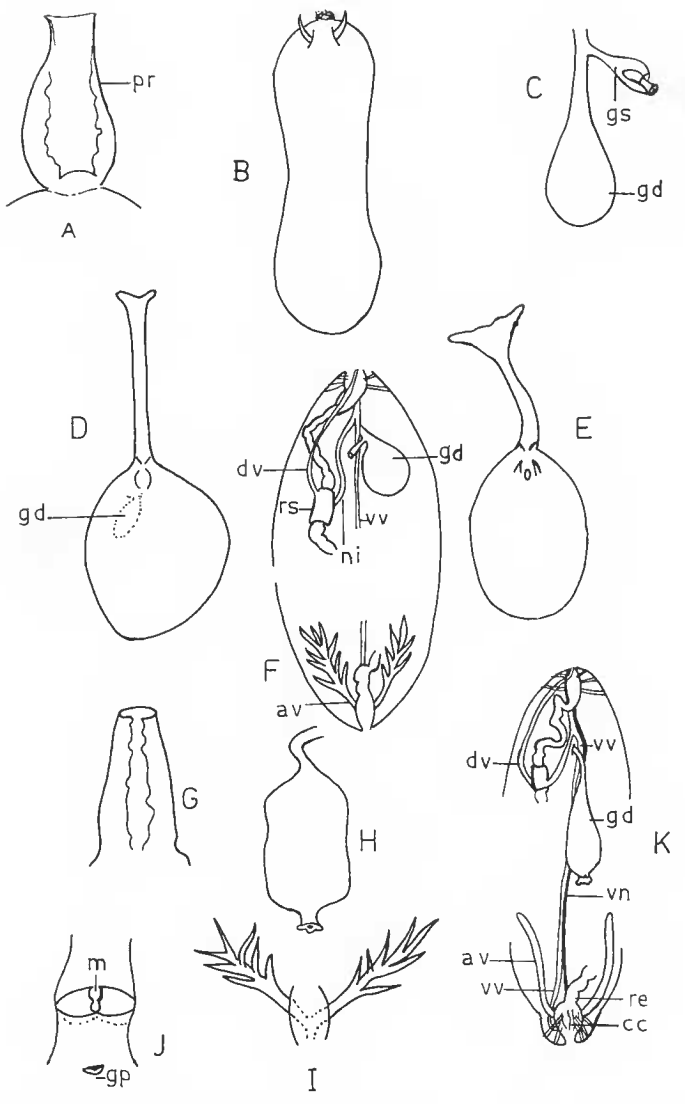


PLATE 3. — A, *Thalassema ovatum*, proboscis × 8. B-C, *Thalassema elapsum* : B, ventral view of female × 4 ; C, gonoduct × 20. D, *Bonellia pumicea*, ventral view × 40. E-F, *Bonellia plumosa* n. sp. : E, ventral view of female × 5 ; F, internal morphology. G-I, *Eubonellia noratlanticum* n. sp. : G, proboscis × 4 ; H, gonoduct ; I anal vesicles. J-K, *Eubonellia longistomum* n. sp. : J, junction of proboscis and trunk ; K, internal morphology.

ag, ampulla like gland ; ar, anal rosette ; av, anal vesicles ; cb, cloacal bulb ; cc, cloacal chamber ; co collar ; dv, dorsal blood vessel ; gd, gonoduct ; gp, genital pore ; gs, gonostome ; m, mouth ; ni, neurointestinal vessel ; pr. proboscis ; re, rectum ; rs, ringsinus ; sc, setal sac ; vh, ventral hooks ; vn, ventral nerve cord ; vv, ventral blood vessel.

Description : The species has been described on the basis of the holotype only. Body of the animal is plump and oval in shape with a narrow proboscis which is as long as the body. Holotype measures 6 mm in length and 4 mm across the broadest part. Proboscis is flat, about 1 mm in breadth and anteriorly bilobed. Body wall of the preserved specimen is transparent and body papillae inconspicuous. Two golden yellow ventral hooks are located close to the junction of proboscis and trunk ; bent tip of the hooks flattened and sharp edged. Single genital pore is situated immediately posterior to the hooks.

Gonoduct is single and saccular (plate 3 F) with gonostome close to the genital pore. Gonostomal lip simple funnel like borne on a stalk. An interbasal muscle is absent. Ring sinus is broad and located at the junction of the pro- and mid-intestine ; neurointestinal vessel is single throughout. Anal vesicles arborescent.

Remarks : The new species *plumosa* can be regarded as nearest to the species *pumicea* named and described by Sluiter (1891). The species *plumosa*, however, differs from the species *pumicea* in the structure of the body wall. Stephen and Edmonds (1972 : 375) have mentioned white papillae as the key to separate *pumicea* from the rest of the species of the genus *Bonellia*. The species *viridis*, *minor*, *pumicea* and *plumosa* unmistakably belong to the genus *Bonellia*. Species *suhmii*, *viridis*, *thomensis* and *minor* have earlier been from the Atlantic.

Genus **EUBONELLIA** Fisher, 1946

Fisher (1946) erected the genera *Eubonellia* and *Bonelliopsis* in both of which the gonostome is located at the distal tip of the gonoduct. Genus *Eubonellia* is represented by the only species *E. valida* named and described by Fisher (1946 : 255-257) on the basis of his studies of the holotype only. The diagnostic characters of the genus are " well developed bifurcate proboscis, no setae, and a single nephridium (right), the distal end of which is expanded into the plicate rim of the large nephrostome ; anal vesicles essentially as in *Bonellia* ". The ventral hooks are absent in *Eubonellia* but present in *Bonelliopsis* which distinguishes the two genera. In the present collection there are a few specimens which undoubtedly belong to the genus *Eubonellia* and represent at least two new species. A little modification in the diagnosis of the genus facilitates accommodating the two new species under *Eubonellia*.

Diagnosis : Bonellidae with well developed proboscis, no setae, and a single gonoduct with terminal gonostome ; anal vesicles dendritic or tubular.

Eubonellia noratlanticum n. sp.

(Plate 1 A ; plate 3 G, H, I)

Material : Holotype female, Biogas VI CV 41 ; collected 16.VI.1974 : type locality coordinates 47°27′ N-9°01′ W, depth 3 800 m. Paratypes 2 females, specimen number, date of collection and locality as for the holotype ; holotype and 1 paratype dissected.

Description : Both holotype and paratypes are light grey in colour in the preserved state. Holotype measures 38 mm in length and 7 mm across the broadest part ; proboscis 6 mm long fleshy and stout. Body wall is thick and covered with conspicuously raised papillae which are more pronounced posteriorly. Proboscis is contracted in all the 3 specimens, also it is wider at its junction with trunk. Lateral margin of proboscis indented and inflected ventrally making the proboscis somewhat tubular. Single genital pore is prominent a little away from the mouth.

Internally the single gonoduct is voluminous and filled with eggs ; gonostome is terminal (plate 3 H) with expanded circular gonostomal lip. Proximal part of gonoduct is a thick muscular tube. Anal vesicles are dendritic bearing short stalked funnels. The two primary ducts of the vesicles unite ventrally (plate 3 I) before opening into the middle of a bulbous cloaca. The rest of the alimentary tube and blood vessels are preserved unsatisfactorily.

Remarks : The new species *Eubonellia noratlanticum* conforms with the description of the only other species of the genus *Eubonellia valida* in all essential respects except the proboscis. In *E. valida* proboscis is long broad and flat, the distal part ends in two narrow limbs. Proboscis is well developed in both *E. valida* and *E. noratlanticum*, the latter being distinguished by a almost tubular proboscis, broader at the base and with indented and inflected lateral margin.

Eubonellia longistomum n. sp.

(Plate 1 B ; plate 3 J, K)

Material : Holotype female, Biogas VI CP 14 ; collected 23.X.1974 : type locality coordinates 47°32′ N-9°35,9′ W, depth 4 237 m. Paratypes 2 females, description as for the holotype ; 1 female, Biogas VI CP 22 ; collected 30.X.1974 : locality coordinates 44°22,9′ N-4°54,8′ W, depth 4 475 m ; 1 female, Venia CP 06 (specimen 2) ; collected 24.XI.1977 : locality coordinates 11°34′ N-32°53′ W, depth 5 880 m ; holotype and 2 paratypes dissected.

Description : The preserved specimens are reddish brown in colour. Holotype measures 36 mm in length and 13 mm across the broadest part. Paratypes are around 60 mm long and 8-10 mm across the broadest part. Body wall of the holotype appears to be fully distended anteriorly and the rounded papillae are less conspicuous in this region. The proboscis is broken and lost in the holotype and the paratypes although the proximal part is present in all the specimens. The broken part of the proboscis adhering to the trunk is broad and flat and covers the mouth dorsally. The junction of the proboscis and the trunk is stout. Mouth opening is a longitudinal cleft, the ventral tip of which extends to the constricted base of the proboscis (plate 3 J) as a thin slit. Single genital pore is located in a prominent transverse pit in the body wall. Posterior end of the body is bulbous in appearance and cloaca opens at the tip of this bulbous end.

Internally (plate 3 K) single gonoduct is a pear shaped organ, the proximal part of which is drawn into a long neck. Gonostome is located at the distal tip of the gonoduct, gonostomal lip circular and frilled. Dorsal blood vessel is relatively thin ; neurointestinal vessel is single throughout ; ventral vessel terminates on the anterior wall of the cloacal

bulb. Thick bundles of longitudinal muscles from the body wall around the cloacal aperture merge with the wall of the cloacal bulb. Anal vesicles are two elongated tubes opening laterally into the cloaca.

Remarks : The species *longistomum* has been accommodated under the genus *Eubonellia* on the basis of single gonoduct with terminal gonostome, a longitudinal slit extending from mouth to the base of the proboscis, and a broad and flat proboscis although the complete morphology of the proboscis could not be ascertained. All the three species of the genus namely, *valida*, *noratlanticum*, and *longistomum* have bulbous cloaca. The species *longistomum* differs from *valida* and *noratlanticum* by its tubular anal vesicles.

Choanostomellia bruuni Zenkevitch, 1964

(Plate 4 A)

Material : 1 female, Polygas DS 26 ; collected 1.XI.1972 : locality coordinates 44°08,2′ N-4°15′ W, depth 2 076 m.

Description : The preserved specimen is pink in colour, and measures 35 mm in length and 10 mm across the broadest part. Body wall is covered with raised irregular papillae. The collar surrounding the proximal part of the proboscis is stout and wide, also deeply incised ventrally. Single genital pore is conspicuous a little away from the junction of the collar and the trunk.

Intestine is full of soft mud and connected with the ventral body wall by means of strong mesenterial strands. Prointestine is provided with a strong muscular gizzard. Gonoduct is a large pear shaped organ with basal gonostome, gonostomal lip is a simple funnel. Anal vesicles probably disintegrated owing to poor preservation.

Remarks : The present specimen is smaller in size than those described earlier (Zenkevitch, 1964*a*) and first record of its occurrence in the Atlantic. Earlier specimens were collected from depths of 3 676 m, 4 360 m and 4 930 m while the present specimen is from a depth of 2 076 m. In the original description the gonoduct is large and pear shaped (Zenkevitch, 1964*a* : 179, fig. 1) instead of round and simple (Stephen and Edmonds, 1972 : 382). The collar of the present specimen is stronger and wider.

Choanostomellia filatovae Zenkevitch, 1964

(Plate 2 D ; plate 4 B, C)

Material : 1 female, Biogas III CV 28 ; collected 28.VIII.1973 : locality coordinates 47°35,3′ N-9°35,9′ W, depth 4 023 m.

Description : Body of the preserved specimen is light yellowish brown in colour and proboscis is pale white. The specimen is 59 mm long of which the proboscis is 18 mm, and 11 mm across the broadest part of the body ; breadth of the proboscis is 7 mm. Body

wall appears to be devoid of papillae but marked with elosely set transverse wrinkles (plate 2 D). Proboseis is flat and uniformly wide (plate 4 B). At the proximal end of the proboseis there is a wide funnel like eollar deeply ineised ventrally. Mouth is loeated on a raised eminenee surrounded by the eollar.

Single gonoduet is a simple oval tube (plate 4 C) eontaining eggs ; gonostome is basal and gnostomal lip eireular and petaloid. Alimentary tube is poorly preserved but the reetal part is undamaged and the anal vesieles eould not be seen. Anal vesieles have not been mentioned by Zenkevitch (1964*b*) in his original deseription.

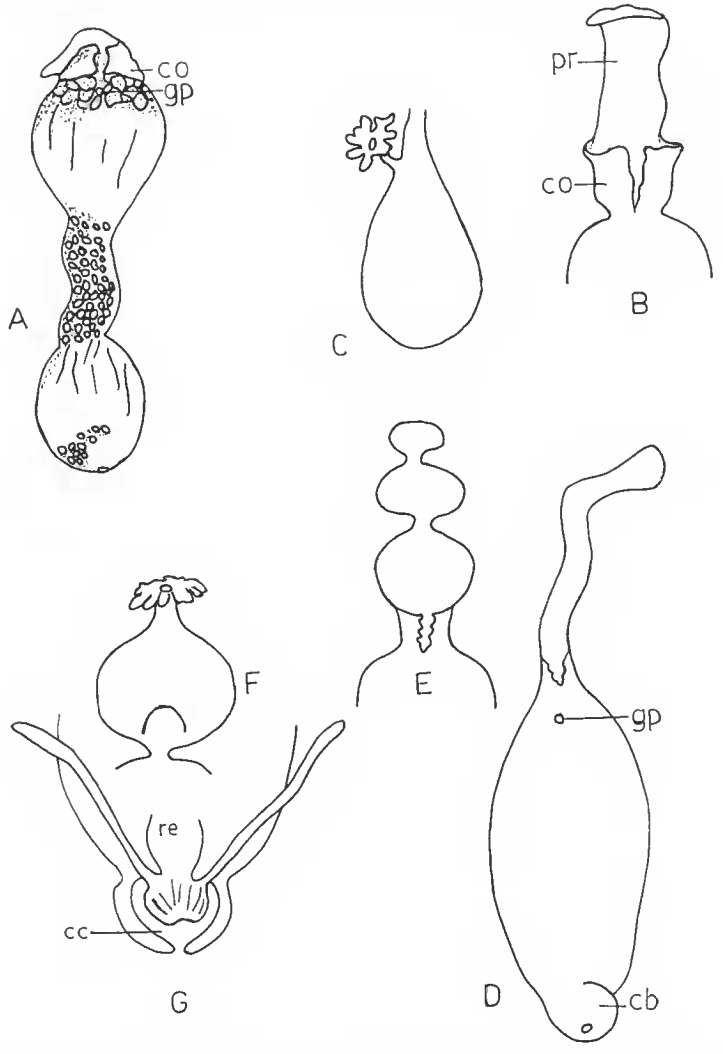


Plate 4. — A, *Choanostomellia bruuni*, ventral view of female × 2. B-C, *Choanostomellia filatovae* : B, proboscis ; C, gonoduct. D-G, *Charcotus charcotus* n. sp. : D, ventral view of female × 1 ½ ; E, proboscis contracted ; F, gonoduct ; G, eloacal bulb.
(*Abbreviations* : *see plate* 3).

Remarks : A ventrally incised collar at the base of the proboscis is a distinguishing character of the genus *Choanostomellia*. Both *C. bruuni* and *C. filatovae* are deep sea forms. Zenkevitch named and described the species on the basis of a single specimen and a proboscis. *C. filatovae* of the present collection is the first report since its discovery and first record of its occurrence in the Atlantic.

Genus **CHARCOTUS** n. gen.

Diagnosis : Bonellids with well developed proboscis ; mouth in an oral cup formed by the inflection of the lateral margins of proboscis proximally ; no ventral hooks ; single gonoduct with terminal gonostome ; anal vesicles long and tubular.

Remarks : The new genus *Charcotus* is nearest to the genus *Eubonellia* Fisher, 1946, which it shares the structure of the gonoduct, absence of ventral hooks and cloacal bulb. In the genus *Charcotus* proboscis forms an oral funnel proximally and the anal vesicles are tubular.

Type-species : *Charcotus charcotus* n. sp.

Charcotus charcotus n. sp.

(Plate 4 D, E, F, G)

Material : Holotype female, Biogas VI CP 10 ; collected 21.X.1974 : type locality coordinates 47°29,6′ N-9°04,5′ W, depth 2 878 m. Paratypes 7 females, number, date of collection and locality as for the holotype ; holotype and 1 paratype dissected.

Description : Preserved specimens are light brown in colour. Holotype measures 40 mm in length and 11 mm across the broadest part. The length of the proboscis is 41 mm. The measurements of the paratypes are as under.

	Body		Proboscis
max. length 42 mm	breadth 11 mm	length 41 mm	
max. length 21 mm	breadth 8 mm	length 6 mm	

Body wall is covered with thick papillae ; cuticle is thick around the genital pore. Posterior tip of the body is bulbous. Proboscis is thin ribbon like although the proximal part near the mouth is thick and stout. In one paratype the proboscis is in a contracted state (plate 4 E). The anterior tip of the proboscis is rounded and the nerve cord passing along the sides (lateral nerve) and the anterior margin of the proboscis can be seen clearly. The genital pore is conspicuous.

Single gonoduct is round in shape, about 3.5 mm in diameter (plate 4 F) ; gonostome is at the distal tip, gonostomal lip petaloid. The proximal part of the gonoduct is a thick muscular tube in which the nematoform male lives. The muscular tube pushes into the lumen of the gonoduct, and the tube at this end is roughly conical. Intestine is filled with soft mud. Cloacal chamber (plate 4 G) is thick and bulbous ; thick bundles of longitudinal muscles are arranged around the cloacal bulb attaching the anterior end of the bulb with the rim of the cloacal aperture.

Anal-vesicles are two tubular organs which open laterally into the anterior end of the cloacal bulb. Neurointestinal vessel is single throughout, and the ventral vessel terminates on the rectal wall at the junction of the rectum and the cloacal bulb.

One male has been found in the proximal muscular tube of the gonoduct. The male is nematoform, without ventral hooks, and measures about 3 mm in length and less than 0.5 mm in breadth.

Charcotus clavatum n. sp.

(Plate 2 B ; plate 5 A)

Material : Holotype female, Incal WS 03 ; collected 1.VIII.1976 : type locality coordinates 48°19′ N-15°23′ W, depth 4 829 m. Paratype 1 female, specimen number, date of collection and locality as for the holotype ; holotype and paratype dissected.

Description : The preserved specimens are light grey in colour. Holotype measures 22 mm in length and 5 mm across the broadest part, the corresponding measurements of the paratype are 25 mm and 8 mm. Papillae are distinclty recognizable in the contracted part of the body (plate 2 B). Prohoscis is fleshy at the proximal end. Genital pore is located in a conspicuous pit in the holotype. Intestine of the holotype is filled with mud shingle and sand ; prointestine is short ; cloacal hulb not sharply demarkated.

Single gonoduct is long and club shaped ; gonostome is terminal, gonostomal lip simple and round (plate 5 A). Anal vesicles are two elongated tubes opening laterally into the cloacal bulb. Neurointestinal emerges as a single vessel and branches into two before opening into the ring sinus (plate 5 A).

Remarks : The species *clavatum* differs from the species *charcotus* by its elongated club shaped gonoduct, the proximal part of which is not muscular and not modified as in *charcotus*, also the cloacal bulb is less prominent.

Maxmuelleria verrucosum (Studer)

(Plate 5 B, C)

Material : 2 females, Incal WS 03 ; collected 1.VIII.1976 : locality coordinates 48°19′ N-15°23′ W, depth 4 829 m.

Description : Both specimens are oval in outline and light grey in the preserved state. Body wall is covered with flat rounded papillae which are more prominent at the

anterior end. Length of the body of one specimen is 13 mm and of the other specimen 8 mm. Proboscis is flat ribbon like and slightly longer than the body in one specimen. 2 ventral hooks are yellowish brown in colour ; there are 2 small accessory hooks.

Intestine is full of soft mud. Gonoducts two, oval in shape and located posterior to the hooks ; gonostome basal, gonostomal lip funnel like lightly frilled and horne on a long stalk (plate 5 C). Anal vesicles tubular bearing long stalked funnels.

Maxmuelleria faex (Selenka, 1885)
(Plate 5 D, E)

Material : 1 female, Walda DS 09 ; collected 24.VI.1971 : locality coordinates 19°17′ S-9°21′ E, depth 4 655 m.

Description : The preserved specimen is white in colour and measures 21 mm in length and 6 mm across the broadest part ; the proboscis is 4 mm long and 0.75 mm broad. Papillae are arranged transversely on the body wall and are conspicuous at the anterior and the posterior ends. Proboscis is smooth and in a contracted state. Close to the junction of the proboscis and the trunk, there are 2 ventral hooks, tips of which are dark brown, sharply bent and pointed. The rest of the body of hooks is golden yellow in colour. Two genital pores are located in pit like depressions in the body wall about 1 mm posterior to the hooks.

Gonoducts are 2 simple sac like structures broader distally and with gonostomes located proximally. Two unequal gonostomal lips (plate 5 E) are borne on a long stalk. Internally the shafts of the hooks are closely packed in a common setal sac (plate 5 E) from wich radiating muscles go to merge with the ventral body wall. Anal vesicles are two slender tubes bearing long primary branches at irregular intervals.

Remarks : Since its discovery *Maxmuelleria verrucosum* of the present collection is the second report of its occurrence and first report from the Atlantic. *Maxmuelleria faex* has earlier been known from the Atlantic. The present description of *M. verrucosum* conforms better with that given by Fisher (1922*c*). Anal vesicles in the genus *Maxmuelleria* Bock, 1942, are sac like and covered with a very large number of excretory tubules. In the species *verrucosum*, anal vesicles are small and branching while in species *faex* the vesicles are tubular with primary branches at irregular intervals. Anal vesicles are described as branching or arborescent (tree like) when the primary branches of a vesicle give rise to secondary or tertiary branches ending in stalked excretory funnels (Menon *et al.*, 1964).

Prometor pocula Hartman and Barnard, 1960
(Plate 2 C ; Plate 5 F, G, H)

Material : 1 female, Biogas III CV 31 ; collected 31.VIII.1973 : locality coordinates 44°20,9′ N-4°52,8′ W, depth 4 293 m.

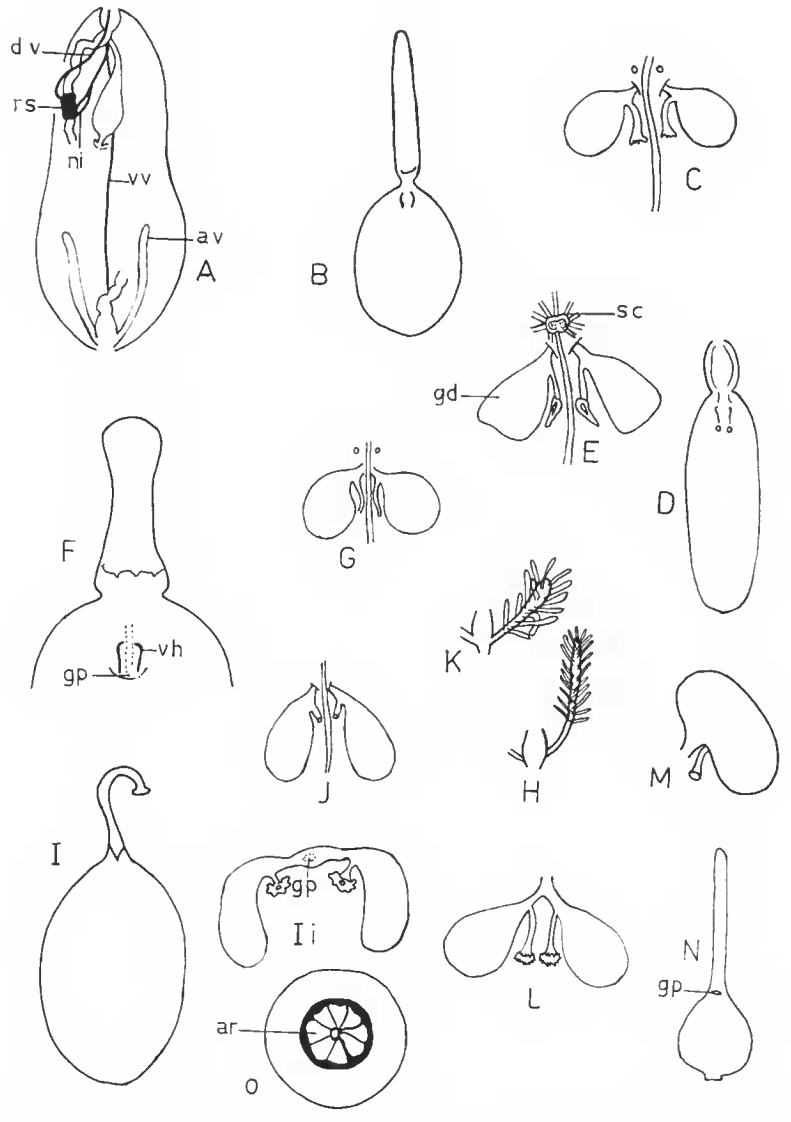


PLATE 5. — A, *Charcotus clavatum* n. sp., internal morphology. B-C, *Maxmuellerium verrucosum*; B, ventral view of female × 3 ; C, gonoduets. D-E, *Maxmuelleria faex* : D, ventral view of female × 2 ; E, gonoduets and ventral hooks. F-H, *Prometor pocula* : F, ventral view of anterior part of female ; G, gonoduets ; H, anal vesiele of one side. I, *Alomasoma nordpacificum*, ventral view of female × 2 ; Ii, gonoducts of *A. nordpacificum*. J-K, *Amalosoma eddystonense* : J, gonoduets ; K, anal vesiele of one side. L, *Alomasoma rhynchollulus* n. sp., gonoduets. M, *Jakobia similaris* n. sp., gonoduet. N-O, *Bruunellia bandae* : N, ventral view of female × 10 ; O, ' anal rosette '.

(*Abbreviations* : *see plate* 3).

Description : The preserved specimen is light pink in colour ; body measures 21 mm in length and 12 mm across the broadest part. Body wall is covered with transparent but conspicuously raised papillae. Proboscis is 8 mm long and 2 mm broad, distal tip widened and rounded and proximally forms a shallow but broad cup leading to the mouth. Dorsal surface of the proboscis is smooth while the ventral surface transversely wrinkled. Ventral hooks are blunt at the tip and dark brown in colour while their long white shafts can be seen as two parallel lines anterior to the genital pore which lies in conspicuous pit (plate 2 C, plate 5 F). Anal aperture is surrounded by glandular structures where the body wall is devoid of papillae (plate 2 C). Gonoducts are 2 small rounded bodies with gonostomes at their proximal end (plate 5 G). Anal vesicles are long tubular sacs bearing long unbranched tubules (plate 5 H).

Remarks : *P. pocula* of the present collection is the first report of its occurrence since its discovery and first record from the Atlantic. The distinctive character of the species is the anal glandular ring, also broadened tip of the proboscis and simple gonostomal lip. The species appears to have external bursa for the ventral hooks (plate 2 C) which is stated to be absent in the genus *Prometor* Fisher, 1948.

Alomasoma nordpacificum Zenkevitch, 1958

(Plate 1 F ; plate 5 I, Ii)

Material : 2 females, Biogas VI CP 11 ; collected 22.X.1974 : locality 47°30′ N-9°07,4′ W, depth 3 056 m ; 1 female, Biogas IV CP 02 ; collected 26.II.1974 : locality coordinates 47°33,2′ N-8°41,4′ W, depth 2 177 m.

Description : The preserved specimens are ligth grey in colour and broadly oval in outline. The largest specimen measures 60 mm in length of which the proboscis is 20 mm and 13 mm across the broadest part. Body wall is covered with papillae of irregular shape. Proboscis is thin and ribbon like ; it is broken in one specimen (plate 1 F). Proximally the proboscis is somewhat fleshy and surrounds the mouth dorsally and laterally. Genital pore is in a pit a little posterior to the junction of the proboscis and the trunk.

Internally there are 2 voluminous gonoducts filled with white eggs ; gonostomes are close to the proximal end, gonostomal lip with frilly margin (plate 5 Ii). Anal vesicles are short bearing long excretory tubules.

Remarks : The genus *Alomasoma* Zenkevitch, 1958, is closely similar to the genus *Amalosoma* Fisher, 1948, but is distinct from the latter by 2 gonoducts which open to the exterior by a common genital aperture. Also the genus *Alomasoma* lacks a genital slit which is typical of the genus *Amalosoma*. Fisher erected the genus *Amalosoma* for his species *Acanthohamingia paradola* in which the genital slit is present but no hooks as in the genus *Acanthohamingia*. In the genus *Amalosoma* the 2 gonoducts open to the exterior separately. Anal vesicles in both *Alomasoma* and *Amalosoma* are small and " broom like ". In *Amalosoma paradola* the vesicular tubules of the anal vesicles may " arise independently from the cloacal wall " or from a " common chamber closely appressed

to the transparent wall of the cloaca " (Fisher, 1946 : 262) as in *Alomasoma nordpacificum* (Zenkevitch, 1958 : 198, fig. 6c). Plate 1 of the present report gives the photographs of *Alomasoma nordpacificum* (plate 1 F) and *Amalosoma eddystonense* (plate 1 C) with broken ends of proboscis in both the specimens. Proboscis seems to be present in *Amalosoma eddystonense* and Stephen (1956) and Stephen and Edmonds (1972 : 370) expressed such a doubt by writing " proboscis not present but probably lost ". Presence or absence of proboscis does not appear to be a reliable basis to make a distinction between *Alomasoma* and *Amalosoma*.

Alomasoma rhynchollulus n. sp.

(Plate 1 D ; plate 5 L)

Material : Holotype female, Noratlante Prel 43 B 7 ; collected 14.IX.1969 : Type locality coordinates 58°49,7′ N-53°03,9′ W, depth 3 360 m ; holotype dissected.

Description : The preserved specimen is light grey in colour, oval in outline and with an extremely short snout like proboscis (plate 1 D, E). Body wall is thick and covered with papillae. Mouth is surrounded by a very rudimentary collarlike ridge and the minute proboscis is continuous with this ridge dorsal to mouth. Holotype measures 33 mm in length and 13 mm across the broadest part. Proboscis is 1.5 mm long, triangular in outline and of uniform thickness. Genital pore is located in a small pit about 12 mm away from the mouth. Raised papillae are thickly set around this pit, also large raised papillae are conspicuous around the anus.

Two gonoducts are oval in shape (plate 5 L) ; gonostome basal, gonostomal lip frilled and borne on a ling stalk. The 2 gonoducts join under the ventral nerve cord and open in the genital pit by a single aperture. Anal vesicles are branching tubules but rudimentary.

Remarks : The new species *rhynchollulus* differs from the 3 other species of the genus *Alomasoma* namely, *belyaevi*, *nordpacificum* and *chaetiferum* by the presence of a minute triangular proboscis according to which the species has been named. Proboscis, 2 gonoducts with a common genital pore and absence of a genital slit indicate the unmistakable affinity of the species to the genus *Alomasoma*.

Jakobia similaris n. sp.

(Plate 1 G ; plate 5 M)

Material : Holotype female, Biogas IV CV 37 ; collected 23.II.1974 : type locality coordinates 47°33,5′ N-9°14′ W, depth 3 000 m ; holotype dissected.

Description : The preserved specimen is white in colour. Body wall is thin, posteriorly the papillae are small, raised and rounded. Body is unsuitable for measurement but could be of the order of 22 mm in length, and the proboscis is as long as the body. Anterior tip of the proboscis is broadened and proximally the proboscis forms a cup like depression where mouth opens. Genital pore not conspicuous.

Single gonoduct is intricately folded (plate 5 M). The position of gonostome, as Zenkevitch (1958) has found in *Jakobia biersteni*, is difficult to ascertain whether basal or terminal. Anal vesicles are branching.

Remarks : The animal could be easily recognized as a species of the genus *Jakobia* by the disc like tip of the long flat proboscis and the intricate folding of its gonoduct. The species *similaris*, however, differs from the only other species of the genus, *J. biersteni* by the absence of sensory structures in the flattened tip of the proboscis and a cup like depression formed by the proximal end of the proboscis. In the type species *Jakobia biersteni*, mouth is surrounded at the sides and back by " lip " like structures.

Bonelliopsis minutus n. sp.

(Plate 6 A, B)

Material : Holotype female, Biogas I DS 10 ; collected 7.VIII.1972 : type locality coordinates 47°36′ N-8°33′ W, depth 2 240 m ; holotype dissected.

Description : The preserved specimen is cucumber shaped and pale green in colour. Body wall is covered with conspicuously raised papillae and enveloped by transparent closely packed ampulla like glands of irregular shape and size. Proboscis has been found separated from the body ; it is well developed and nearly half as long as the body. Body is 3 mm in length and 0.5 mm across the broadest part. Single genital pore is located in a shallow depression on the body wall close to the base of the ventral hooks. Ventral hooks are pearly white in colour and half as long as the body. The tips of the hooks are sharply bent and pointed.

Internally there are 2 long tubular gonoducts (plate 6 B). Gonostome is a small funnel at the distal tip of the gonoduct. Proximal ends of the gonoducts join the ventral nerve cord to form a single duct which opens to the exterior. Anal vesicles are 2 tubular organs without any branch.

Remarks : The inclusion of the new species *minutus* under the genus *Bonelliopsis* has not been beyond doubts. The basis of inclusion is the terminal gonostome, also short presiphonal gut and 2 ventral hooks in the female in the species *minutus*. The proboscis of the species *minutus* is much broader anteriorly but not deeply bifid as in *Bonelliopsis alaskana*, the only other species of the genus. One of the diagnostic features of the genus *Bonelliopsis* is single gonoduct, but the species *minutus* has 2 gonoducts. From the point of view of number and disposition of gonoducts, the species resembles *Alomasoma belyaevi* and other species of the genus. In *Alomasoma* gonostome is basal and gonostomal lip borne on a long stalk. Fisher (1946) has described " squarish gladular thickenings arranged in irregular longiseries " in the body wall of *B. alaskana*. Over the body wall of the present species there are ampulla like glands. Body wall with its modifications appear to be a characteristic feature of the genus. *Anelassorhynchus porcellus* Fisher, 1948, happens to be another such species which has glandular swellings of the skin. The distinctive characters of the species *minutus* are anteriorly broad proboscis not bilobed, 2 tubular gonoducts, and anal vesicles tubular unbranched.

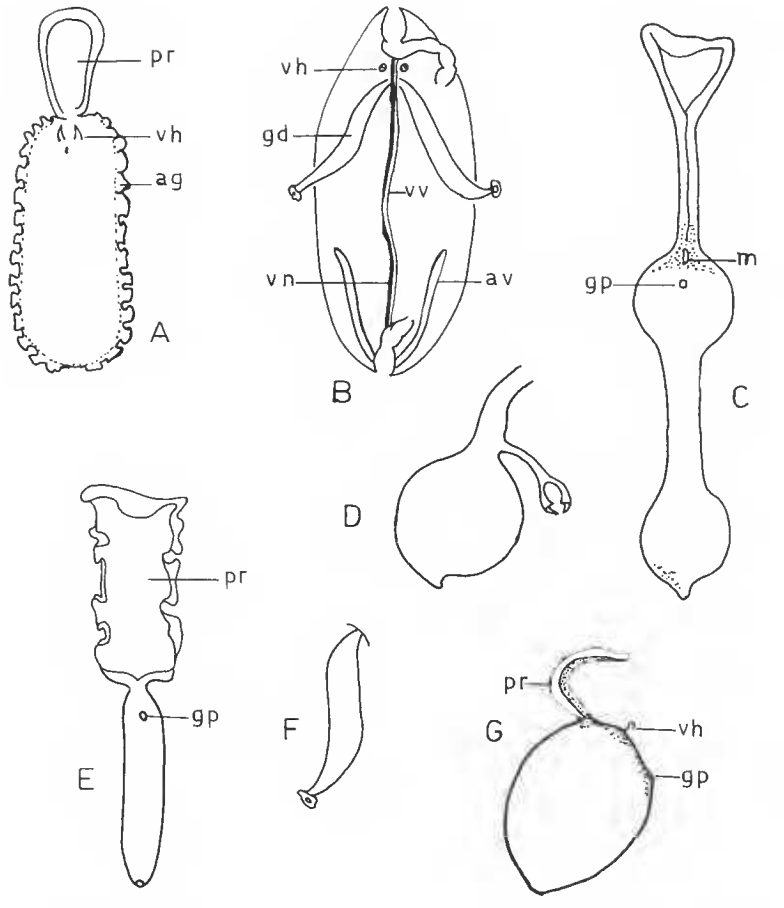


Plate 6. — A-B, *Bonelliopsis minutus* n. sp. : A, ventral view of female × 15 ; B, internal morphology C-D, *Sluiterina flabellorhynchus* : C, ventral view of female × 3 ; D, gonoduct. E-F, *Torbenwolffia galatheae* : E, ventral view of female × 2 ; F, gonoduct. G, *Protobonellia mitsukurii*, lateral view of female × 15.
(*Abbreviations* : *see plate* 3).

Sluiterina flabellorhynchus Murina, 1976
(Plate 6 C, D)

Material : 1 female, Vema CP 06 ; collected 24.XI.1977 : locality coordinates 11°34′ N-32°53′ W, depth 5 880 m.

Description : The preserved animal is of ligth flesh colour. Body wall is covered with papillae and transverse wrinkles. The specimen measures 21 mm in length and 13 mm

across the broadest part. The proboscis of the animal is somewhat spoon shaped, 12 mm long and the narrow limb about 2.5 mm wide. The distal end of the proboscis is expanded into a triangular fleshy lobe with a shallow cup in the middle. The junction of the proboscis and the trunk is narrow but strong. Single genital pore is located close to the mouth.

Gonoduct is single and consists of a proximal long stout tube and distal voluminous sac. Gonostome is located at the junction of the tube and the sac ; gonostomal lips are 2 lateral folds borne on a long stalk. Anal vesicles are 2 long tubular sacs bearing a large number of excretory tubules.

Remarks : Information with regard to the generic distinction of *Sluiterina* Monro, 1927, was inadequate for a long time. Murina (1976) gave a description of the distinctive characters of the genus *Sluiterina*. Since its discovery from the South Atlantic (Murina, 1976), *S. flabellorhynchus* of the present collection is the first report of its occurrence.

Torbenwolffia galatheae Zenkevitch, 1966

(Plate 6 E, F)

Material : 2 females, Vema CP 06 ; collected 24.XI.1977 : locality coordinates 11°34′ N-32°53′ W, depth 5 880 m.

Description : Both specimens are damaged posteriorly. The preserved specimens are pink in colour ; body wall very thick and covered with flattened papillae. Compared with the body the proboscis is enormous and fleshy (plate 6 E). Proximally the lateral margins of the prohoscis meet ventrally. The proboscis of the animal is in all probability in contracted state and should be much longer when fully extended. Single genital pore is very conspicuous and is located about 6 mm away from the junction of the proboscis and the trunk.

Internally the gonoduct is an elongated tube, its narrow terminal end bears a small gonostomal funnel (plate 6 F). Anal vesicles could not be seen owing to the damaged condition of the posterior part.

Remarks : *T. galatheae* of the present report is the first record of its occurrence in the Atlantic. The proboscis of the species has been reported to vary considerably in shape after fixation. According to Zenkevitch (1966), *T. galatheae* is one of those ultra-abyssal forms.

Protobonellia mitsukurii Ikeda, 1904

(Plate 6 G)

Material : 1 female, Incal WS 03 ; collected 1.VIII.1976 : locality coordinates 48°19′ N-15°23′ W, depth 4 829 m.

Description : The animal is extremely small in size with a proboscis as long as the body. DattaGupta (1975) described 2 specimens of *P. mitsukurii* of the Vema collections

which are equally small in size and lifted from comparable depths. Proboscis of the present specimen is somewhat tubular by the ventral inflection of its lateral margins. Body papillae are more pronounced at the anterior end. Two large ventral hooks are located on a raised eminence of the body wall posterior to which is the genital pore on a lesser eminence (plate 6 G).

Single gonoduct is oval in shape, gonostome basal, gonostomal lip with frilly margin and borne on a stalk. Anal vesicles small and branching.

Amalosoma eddystonense Stephen, 1956

(Plate 1 C ; plate 5 J, K)

Material : 2 females, Biogas CP 21 ; collected 30.X.1974 : locality coordinates 44°21,2′ N-4°49,3′ W, depth 4 453 m ; 1 female, Biogas VI CP 19 ; collected 28.X.1974 : locality coordinates 44°24,9′ N-4°51,3′ W, depth 4 434 m.

Description : The preserved specimens are greyish pink in colour and cucumber shaped. Body wall is covered with thick warty papillae of irregular shape. A slightly elevated fleshy ring surrounds the mouth and the broken end of a proboscis about 4 mm long covering the mouth dorsally is recognizable (plate 1 C). The specimens measure 36-37 mm in length and 10-14 mm across the broadest part. A little away from the mouth there is a midventral genital slit (plate 1 C) ; 2 genital pores are located at the posterior end of this slit.

Internally 2 large voluminous gonoducts (plate 5 J) are situated on either side of the ventral nerve cord and filled with bright yellow eggs ; gonostome basal, gonostomal lip slightly petaloid and borne on a stalk. Anal vesicles are 2 small but stout sacs, the distal half of which bears long excretory tubules (plate 5 K).

A male specimen was found in the body cavity of a specimen (CP 21). The male is 1.5 mm long and has 2 ventral hooks.

Bruunellia bandae Zenkevitch, 1966

(Plate 5 N, L, O)

Material : 1 female, Biogas IV DS 57 : collected 23.II.1974 : locality coordinates 47°30,8′ N-9°07,6′ W, depth 2 906 m.

Description : The preserved animal is pear shaped and white in colour. The animal measures 5 mm in length of which the proboscis is 3.5 mm. Body wall is transparent and covered with regularly interspersed small raised papillae. Proboscis is oval in cross section, yellowish in colour with speckled dots. Mouth opening is prominent at the junction of the proboscis and the trunk. The most characteristic feature of the animal is its " anal rosette " (Zenkevitch, 1966). The circumanal area is modified as a fleshy ring with margin folded inward (plate 5 O) and there are folds of muscles around the anal aperture as figured.

Internally, ventral hooks gonoduets and anal vesicles could not be seen. Intestine of the animal has geen found completely ruptured although coils of intestine filled with mud were clearly visible from outside through the transparent skin. Body cavity contained many large white eggs.

Remarks : The animal has been identified on the basis of its characteristic proboscis and " anal rosette ". The present animal is much smaller in size than those of the original description (Zenkevitch, 1966). In the original description gonoduets, anal vesicles, or blood vessels have not been mentioned. In the present specimen also these structures could not be found. Many echiuran species lack ventral hooks or setae, also the anal vesicles can be wanting or rudimentary, not easily traceable in an imperfectly preserved specimen. One would, however, be curious about the gonoduet. In the present specimen large round gonads have been seen in the body cavity but there is no trace of gonoduet. The proboscis and " anal rosette " are indeed very characteristic in order to recognize the species, yet the true taxonomic status of *Bruunellia bandae* should await further information about its anatomy.

Acknowledgements

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ADDENDUM

The material Walda DS 05 is a complete proboscis separated from an echiuran body, in all probability from a species of *Maxmuelleria*. The anterior extremity of the proboscis of *M. lankesteri* is " bluntly rounded or drawn out laterally into two small ear-like horns " as in the present specimen. Similarly, the material Biogas III DS 49 is a complete proboscis probably of a species of *Prometor*. The material MD 08 BB 397 is an echiuran larva, pinkish white in colour, 1.5 mm long and 0.5 mm broad. The different zones of the larval body are not recognizable.

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